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Marshall Star, April 4, 2012 Edition

# MARSHALL STAR

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## Message from Acting Center Director: Marshall Team Invited to 'Farewell to Robert Lightfoot' Event April 5

Please join me for a "Farewell to Robert Lightfoot" on April 5 from 3 to 4 p.m. in the Activities Building 4316, immediately following the Marshall Exchange's Gourmet Chocolate Social that's scheduled to begin at 2 p.m. This is an opportunity for our organizations and employees to express their appreciation to Robert for his dedicated and distinguished service to Marshall and to extend best wishes to him in his new role at NASA Headquarters. Please make plans to attend and help us pay tribute to Robert.

Hope to see you there.

Gene Goldman



Gene Goldman (NASA/MSFC)

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## Space Launch System Program Completes Step One of Combined Milestone Reviews

*By Amie Cotton*



America's next heavy-lift launch vehicle -- the Space Launch System -- is one step closer to its first launch in 2017, following the successful completion of the first phase of a combined set of milestone reviews.

***Image left: Among the NASA team members conducting key milestone reviews March 29 for NASA's Space Launch System, America's next heavy-lift launch vehicle, are, from right foreground, Todd May, SLS Program manager at Marshall; Don Noah, with his back to the camera, a member of the Standing Review Board; and Garry***

***Lyles, SLS chief engineer at Marshall. The review teams completed the first step in a combined System Requirements Review and System Definition Review -- parallel studies that set requirements to narrow the scope of the system design and evaluate the vehicle concept based on top-level program requirements. (NASA/MSFC)***

The SLS Program has completed step one in a combined System Requirements Review and System Definition Review -- both extensive, NASA-led reviews that set requirements to further narrow the scope of the system design and evaluate the vehicle concept based on top-level program requirements. The reviews include setting launch vehicle requirements for crew safety and interfacing with the Orion Multi-Purpose Crew Vehicle to carry it to deep space, as well as the ground operations and launch facilities at the Kennedy Space Center. Additionally, the reviews set cost and schedule requirements to provide on-time development.

"It's exciting to see how far this program has come in such a short time," said Todd May, SLS program manager at the Marshall Space Flight Center. "Completion of this first step of reviews moves the nation's first deep space rocket from concept development to preliminary design."

The milestone reviews are two in a series of life-cycle reviews advancing the vehicle from concept design to flight readiness. Step one included a focused technical review of the program requirements with information on cost, schedule and risk. A standing review board comprised of technical experts from across the agency evaluated SLS program documents including vehicle requirements, specifications, plans, studies and reports. The board ensured specific criteria were met and confirmed that requirements are complete, validated and responsive to mission requirements.

The combination of the two reviews, as well as safety and reliability analyses, is a fundamentally different way of conducting program reviews. The SLS team is streamlining processes to provide a safe, affordable and sustainable rocket.

"This checkpoint gives us a mature understanding of the requirements, solidifies the vehicle concept design will meet all the requirements of the program and mission, and signals that SLS is ready to begin engineering design activities," added May. "We're moving forward to deliver a new national capability to get America exploring space again."

Step two, which will begin in early summer, will include an integrated assessment of the technical and programmatic components fully evaluating cost, schedule and risk involved with the program.

The Space Launch System will provide an entirely new capability for human exploration beyond Earth orbit, taking astronauts farther into space than ever before. It also can back up commercial and international partner transportation services to the International Space Station. Designed to be flexible for crew or cargo missions, the SLS will continue America's journey of discovery from the unique vantage point of space. The Marshall Center is leading the design and development of the rocket that can take us to the asteroids, Lagrange points -- positions in space where a satellite or science instrument could be stationed in a relative steady state -- the moon, and eventually to Mars.

## **SLS Avionics Test Paves Way for Full-Scale Booster Firing**

*By Amie Cotton*

NASA has successfully tested the solid rocket booster avionics for the first two test flights of the Space Launch System, America's next heavy-lift launch vehicle. This avionics system includes electrical components for SLS solid rocket boosters, which provide propulsion to augment the core stage main engines of the rocket. The first qualification test of the five-segment SLS booster is slated for spring 2013.

***Image right: A technician with ATK of Brigham City, Utah, makes final adjustments prior to the March 28 Flight Control Test 1, testing the avionics and controls for NASA's Space Launch System booster. (NASA/ATK)***



The March 28 test, dubbed Flight Control Test 1, or FCT-1, included heritage Thrust Vector Control, or TVC, actuators -- electro-hydraulic mechanisms previously used on the space shuttle that direct the booster propulsion system -- with a new SLS booster avionics subsystem. ATK of Brigham City, Utah, the SLS booster prime contractor for the first two test flights, conducted the test at its Promontory, Utah, test facility.

The test successfully demonstrated the new avionics subsystem's interface and control of the heritage shuttle Thrust Vector Control system and performed an SLS launch simulation. In addition to the new avionics subsystem, the test included new electronic ground support equipment which monitored and coordinated activities between the test facilities, avionics subsystem and TVC system. The test is one in a series to reduce risk and demonstrate the avionics subsystem design early in the development life cycle.

"We were pleased to see how the avionics system functioned outside the lab," said Todd May, Space Launch System program manager at the Marshall Space Flight Center. "This test provides an insightful first look at how the booster Thrust Vector Control system will operate and interface with flight hardware."

The booster avionics design has incorporated lean manufacturing and continuous improvement principles. For example, the design includes a common, ruggedized chassis design, 14 common programmable circuit cards and standardized cable designs.

Two additional tests are planned for the avionics and controls system.

The Space Launch System will provide an entirely new heavy-lift launch capability for human exploration beyond Earth orbit and will take crew and cargo farther into space than ever before.

For images of the test and more information about SLS, visit <http://www.nasa.gov/sls>.

*Cotton, an AI Signal Research Inc. employee, supports the Office of Strategic Analysis & Communications.*

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## NASA Fires Up Rocket Sled Hardware at China Lake



NASA recently performed a trial run on a rocket sled test fixture, powered by rockets, to replicate the forces a supersonic spacecraft would experience prior to landing. The sled test is one of nine missions managed by the Marshall Space Flight Center's Technology Demonstration Missions Program for NASA's Office of the Chief Technologist in Washington. The Low-Density Supersonic Decelerator Project, or LDSD, will test inflatable and parachute decelerators to slow spacecraft prior to landing, and allow NASA to increase landed payload masses, improve landing accuracy and increase the altitude of safe landing sites. These new devices represent the first steps on

the technology pathway to land humans and habitats safely on Mars or other destinations, and the return rockets to bring them back to Earth safely. The test series is led by the Jet Propulsion Laboratory and conducted at the U.S. Naval Air Weapons Station at China Lake, Calif. (NASA/JPL)

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## Safety, Health and Environmental Day 'Happens' May 2

*By Megan Davidson*

On May 2, Marshall Space Flight Center team members are invited to Safety, Health and Environmental, or SHE, Day. The event, with the theme "SHE Happens," will combine both the traditional Marshall Earth Day as well as Safety and Health Day activities, while offering more hands-on demonstrations and interactive exhibits.

Activities will be held from 10 a.m. until 2 p.m. both in and outside Buildings 4315 and 4316. A yoga-for-anxiety class, a HEMSI search-and-rescue dog demonstration, and information on master planning and flight safety are just a few of the more than 30 SHE Day activities and exhibits. Free tree seedlings also will be provided by Wyle Laboratories' Science, Technology and Engineering Group of Huntsville. Lunch will be available for purchase from several food vendors between 11 a.m. and 1 p.m.





SHE Day is a stand-down event. With the exception of mandatory services -- such as fire, security and cafeterias -- all work will be suspended so Marshall team members can participate in SHE Day activities.

Team members also can earn four hours training credit for attending the event. Sign-up is required through SATERN to obtain the credit. The course is listed as "SHE Day 2012."

More detailed information, including a schedule and map, is forthcoming and will be posted on ExplorNet.

*Davidson, an AI Signal Research Inc. employee, supports the Office of Strategic Analysis & Communications.*

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## For a Safe and Healthy Center: Team Members Need to Read the 2012 SHE Program Plan

*By Jessica Eagan*



The [Safety, Health and Environmental Committee](#) believes it is critical that the Marshall Space Flight Center team works together to provide a safe and healthful working environment as we all focus on supporting NASA's [goals](#).

To make sure that we're all moving together in the right direction, the FY 2012 [SHE Program Plan](#) was established. Its purpose is to outline Marshall's policy, vision, goals and measurable milestones, and recommend actions to assist the center in improving the [SHE Program](#).

"It is important for all center employees to become familiar with this program plan because it outlines top center management's expectations relative to everyone's health and wellness," said John Pea, branch chief of the Industrial Safety Branch in the Safety & Mission Assurance Directorate.

The [SHE Policy](#) is broken down into three parts, each supporting mission success: safety, health and environmental. Marshall strives to prevent injury and ensure the safety of all operations and products; prevent occupational illnesses and promote and maintain the physical and mental well-being of its employees; and provide environmental compliance and stewardship, and a safe and healthful workplace for its employees.

The [vision](#) is divided into two parts: safety and health, and environmental. Under safety and health, the SHE program wants to make sure no one who comes to Marshall is injured; there is no safety-related property damage; everyone is in full compliance with the [Occupational Safety and Health Administration's](#) requirements for chemical handlers; there is excellent participation in the medical monitoring program; and all civil service employees and contractors participate in the center's new [Incident and Injury-Free workshop](#), led and facilitated by Marshall employees.

Each Incident and Injury-Free workshop participant will consider and examine his or her own relationship to safety and well-

being, and work with fellow employees to elevate collective awareness levels at Marshall.

"Management has embraced an incident and injury-free environment to move us toward a safety culture based on attitudes and caring," said Pea. We hope that everyone participates in the four-hour workshop by the end of the year." To register, employees can visit *Inside Marshall* and click the Incident and Injury-Free icon, or register through [SATERN](#).

Under environmental [vision](#), the mission is to raise environmental awareness and accountability throughout the center; innovate attitudes that achieve compliance while supporting NASA's mission; sustain development and operations in center programs; and continue proactive communication to minimize risks to the successful implementation of the compliance, restoration and sustainability programs at the center.

These policies and visions wrap up into the FY12 [goals](#): maintain SHE metrics of at least 97 percent "green"; continue to improve Marshall's SHE Program by appropriately dispositioning findings from the internal FY 2011 Safety and Health, and Environmental Management System Audits; maintain [International Organization for Standardization 14001 Environmental Management Systems Registration](#); and continue safety culture improvements by providing Incident and Injury-Free discussions to 90 percent of civil service employees and 75 percent of onsite contractors.

"Everyone at Marshall needs to read [Section A](#), Management Leadership and Employee Involvement, of this document, beginning on page 3," said Pea. "Becoming familiar with this will help managers and their employees better understand the reason for many of the requirements levied, and why we measure and track them."

Section A.1 lists requirements management should follow to demonstrate their commitment to safety and health. This includes establishing, documenting and communicating to their civil service and contract employees clear and relevant goals, objectives, policies and procedures while making sure everyone is provided with equal, high-quality protection. Managers also should maintain a written [safety and health management system](#) to reduce the number and severity of work-related injuries and illnesses, and in return, reduce costs. And, most important, all managers should set an example of doing anything that they expect their employees to do. For a complete list of responsibilities, visit [here](#).

Under section A.2, employees can learn their requirements under "Employee Involvement." According to this SHE Program Plan, employees must be trained for the tasks that they perform, and if they bring any suggestions, ideas, reports of hazards, etc., to the manager's attention, they must receive feedback with documented evidence. In addition to one's right to report a hazard, everyone must be involved in the safety and health management system in at least three meaningful, constructive ways, including participating in audits, accident/incident investigations, self inspections, suggestion programs, planning, training, job hazard analyses, and appropriate safety and health committees and teams. Employees do not meet this requirement by participating in incentive programs or by working safely. To read more about employee involvement, visit [here](#).

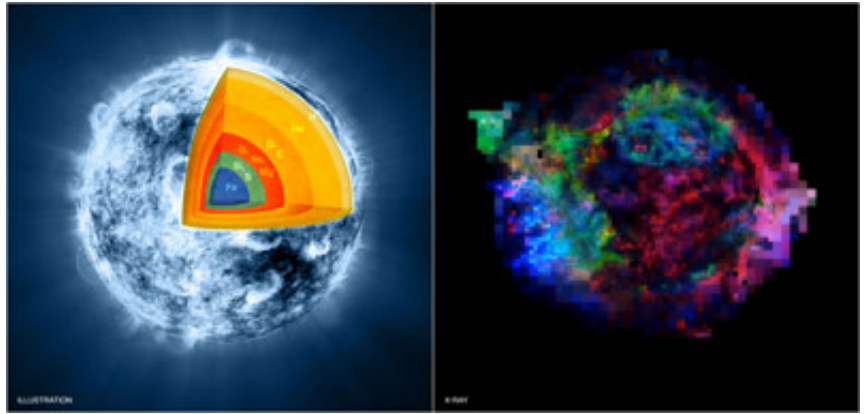
"Each employee must keep their eyes open to any hazards they encounter while working," said Pea. "Recognizing dangerous conditions and the signs and symptoms of workplace-related illnesses and injuries can really help us cut down on mishaps, resulting in a friendly environment for all of us to successfully perform our jobs."

Marshall team members can visit [here](#) to read the entire SHE Program Plan. For more information about the center's SHE Program, visit this [site](#).

*Eagan, an AI Signal Research Inc. employee and the Marshall Star editor, supports the Office of Strategic Analysis & Communications.*

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A new X-ray study of the remains of an exploded star indicates that the supernova that disrupted the massive star may have turned it inside out in the process. Using very long observations of Cassiopeia A, or Cas A, a team of scientists has mapped the distribution of elements in the supernova remnant in unprecedented detail. This information shows where the different layers of the pre-supernova star are located 300 years after the explosion, and provides insight into the nature of the supernova.



An artist's illustration on the left shows a simplified picture of the inner layers of the star that formed Cas A just before it exploded, with the predominant concentrations of different elements represented by different colors: iron in the core (blue), overlaid by sulfur and silicon (green), then magnesium, neon and oxygen (red). The image from the Marshall Space Flight Center-managed Chandra X-ray Observatory on the right uses the same color scheme to show the distribution of iron, sulfur and magnesium in the supernova remnant. The data shows that the distributions of sulfur and silicon are similar, as are the distributions of magnesium and neon. Oxygen, which according to theoretical models is the most abundant element in the remnant, is difficult to detect because the X-ray emission characteristic of oxygen ions is strongly absorbed by gas along the line of sight to Cas A, and because almost all the oxygen ions have had all their electrons stripped away.

A comparison of the illustration and the Chandra element map shows clearly that most of the iron, which according to theoretical models of the pre-supernova was originally on the inside of the star, is now located near the outer edges of the remnant. Surprisingly, there is no evidence from X-ray (Chandra) or infrared (NASA's Spitzer Space Telescope) observations of iron near the center of the remnant, where it was formed. Also, much of the silicon and sulfur, as well as the magnesium, are now found toward the outer edges of the still-expanding debris. The distribution of the elements indicates that a strong instability in the explosion process somehow turned the star inside out.

This latest work, which builds on earlier Chandra observations, represents the most detailed study ever made of X-ray-emitting debris in Cas A, or any other supernova remnant resulting from the explosion of a massive star. It is based on a million seconds of Chandra observing time. Tallying up what they see in the Chandra data, astronomers estimate that the total amount of X-ray-emitting debris has a mass just over three times that of the sun. This debris was found to contain about 0.13 times the mass of the sun in iron, 0.03 in sulfur and only 0.01 in magnesium.

The researchers found clumps of almost pure iron, indicating that this material must have been produced by nuclear reactions near the center of the pre-supernova star, where the neutron star was formed. That such pure iron should exist was anticipated because another signature of this type of nuclear reaction is the formation of the radioactive nucleus titanium-44, or Ti-44. Emission from Ti-44, which is unstable with a half-life of 63 years, has been detected in Cas A with several high-energy observatories including the Compton Gamma Ray Observatory, BeppoSAX and the International Gamma-Ray Astrophysics Laboratory.

These results appeared in the Feb. 20 issue of The Astrophysical Journal in a paper by Una Hwang of the Goddard Space Flight Center and Johns Hopkins University in Baltimore, Md., and (John) Martin Laming of the Naval Research Laboratory in Washington.

(NASA/CXC/M.Weiss; Image: NASA/CXC/GSFC/U. Hwang & J. Laming)

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## Marshall Tests Dual Ion Spectrometer Flight Sensors for Magnetospheric Multiscale Mission



Researchers at the Marshall Space Flight Center are testing the Dual Ion Spectrometer flight sensors for the Magnetospheric Multiscale -- or MMS -- mission, a NASA Solar Terrestrial Probes study. From left are Takznobu Omoto of the Japan Aerospace Exploration Agency, or JAXA; Mark Cox of Marshall; and Toshihiro Kobzyashi of JAXA. They are testing the spectrometer sensor for MMS in the Low Energy Electron and Ion Facility clean tent at the National Space Science and Technology Center in Huntsville. Scientists and engineers expose the spectrometer to ion beams of specific energy and direction to determine the response. That response will then be used to calibrate the flight data. Dr. Victoria Coffey and her team from Marshall's Natural Environments

Branch are responsible for calibrating the reaction when disclosed to the space environment. There are 16 spectrometer instruments. They will be paired with 16 Dual Electron Spectrometers to comprise the Fast Plasma Instrument suite, one of several that make up the full instrument package. The MMS mission is comprised of four identically instrumented spacecraft. Each will use Earth's magnetosphere as a laboratory to study the microphysics of three fundamental plasma processes: magnetic reconnection, energetic particle acceleration and turbulence. The Goddard Space Flight Center manages the mission. Jim Burch of the Southwest Research Institute in San Antonio is the principal investigator for the science investigation. Marshall is a co-investigator institution and part of the Fast Plasma Instrument team. For more information, visit <http://mms.gsfc.nasa.gov/>.

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## NASA Woman-Owned Small Business Industry Day Draws More than 300 Participating Companies



Teresa Foley-Batts, policy manager in the Marshall Space Flight Center's Office of Procurement, welcomes attendees to the NASA Woman-Owned Small Business Industry Day on March 29 at the Huntsville Museum of Art. Other speakers included, from left, Robin Henderson, Marshall Center associate director; Glenn Delgado, associate administrator of NASA's Office of Small Business Programs in Washington; Debbie Batson, a business manager and small business liaison at Teledyne Brown Engineering Inc. of Huntsville; and Huntsville Mayor Tommy Battle. More than 300 companies attended the event and had the opportunity to participate in a variety of activities, including workshops and a meet-and-greet session with Marshall technical and procurement personnel, small business



technical coordinators and prime contractors. Business representatives also engaged in one-on-one business matchmaking sessions to present their capabilities to Marshall prime contractors and NASA small business specialists. "We are very excited Marshall was selected as the host center for this industry day," said David Brock, small business specialist in Marshall's Office of Procurement. "We had the opportunity to bring small businesses, specifically women-owned businesses, in contact with Marshall's prime contractors, procurement and technical personnel. It created great networking opportunities, and we hope this will pay off for women-owned small businesses that attended the event." (NASA/Marshall/Ray Downward)

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